MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 3, 2017/2018

PMT0101 – MATHEMATICS I

(All sections / Groups)

4 JUNE 2018
9:00 a.m. – 11:00 a.m.
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of six pages with **FIVE** questions.
2. Attempt **ALL** questions. All questions carry equal marks and the distribution of the marks for each question is given.
3. Please write all your answers in the answer booklet provided.
4. **No calculators are allowed**.
5. **You are required to write proper steps.**

ANSWER ALL QUESTIONS.

QUESTION 1 [10 marks]

a) Simplify the following expression and write your final answer with no negative exponents. Assume that all variables have positive values. Show proper steps.

$$\frac{x^3(xy)^{-4}z^{-3}}{x^{-3}yz^{-2}}$$ [2 marks]

b) Simplify the radicals and write the final answer as a single term.

$$\sqrt{75}-\sqrt{972}$$ [2 marks]

c) Simplify the following expression. Write your final expression as a single fraction.

$$\frac{x^2-4}{3x^2-9x}\div\frac{x^2+x-6}{x^2-9}$$ [3 marks]

d) Express the following in the form $a+bi$ where a and b are real numbers.

$$\frac{1}{2-i}+\frac{1}{1+2i}$$ [3 marks]

Continued .....

QUESTION 2 [10 marks]

a) Solve the equation $|5x + 11| = 41$. [2 marks]

b) Solve the equation $\sqrt{15 - 3x} = 1 + x$. Remember to check your answers. [3 marks]

c) (i) Solve the quadratic equation $x^2 + 4x - 5 = 0$.

(ii) Solve the inequality $\frac{x^2+4x-5}{x+3} > 0$.
Give your final answer in interval notation.

(iii) Find the domain of the function $f(x) = \sqrt{\frac{x^2+4x-5}{x+3}}$.
Give your final answer in interval notation.

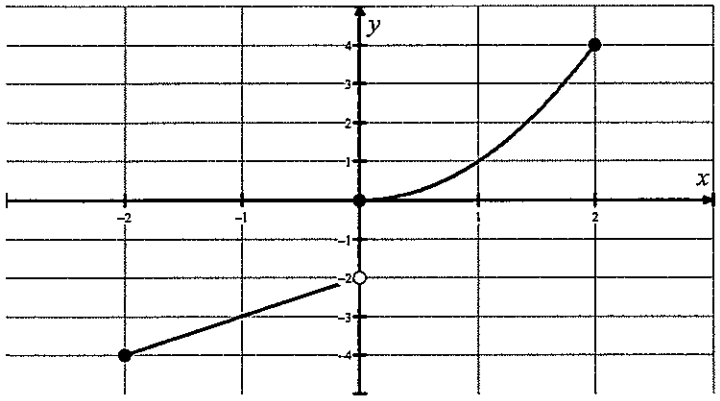
[5 marks]

Continued .....

QUESTION 3 [10 marks]

a) The following figure shows the graph of the function

$$f(x) = \begin{cases} x - 2 & \text{if } -2 \le x < 0 \\ x^2 & \text{if } 0 \le x \le 2 \end{cases},$$



(i) State the domain and range in interval notation.
(ii) State whether the function f is a one-to-one function.

[2 marks]

b) Given the functions $f(x) = \sqrt{x+3}$ and $g(x) = \dfrac{3}{x^2-5}$, find

(i) $(f \circ g)(1)$, giving your final answer in the form $\dfrac{m}{n}$ where m and n are integers.

(ii) $f^{-1}(x)$, as a polynomial in x.

[3 marks]

c) You are required to sketch the graph of the polynomial function

$$f(x) = (x-3)(x+3)^2(x-1)^4.$$

(i) What is the degree of f ?
(ii) Find the zeros of f and their multiplicities.
At each zero, determine whether the graph of f crosses or touches the x-axis.

(iii) Find the y-intercept of the graph of f.
(iv) Determine the end behavior of f.
(v) Sketch the graph of the function f. Make sure that your graph shows all intercepts and exhibits the proper end behaviour.

[5 marks]

Continued .....

QUESTION 4 [10 marks]

a) Use long division to find the quotient and the remainder when the polynomial $2x^5 - x^3 + 2$ is divided by $x^2 - 1$.

You are required to state clearly what the quotient and the remainder are.

[3 marks]

b) Given $H(x) = 3\left(\frac{1}{2}\right)^x - 2$.

(i) Find $H(-2)$.

(ii) Find the value of x such that $H(x) = -\frac{13}{8}$.

[3 marks]

c) The graph of $y = a\ln(x+b)$ passes through points $(0, 0)$ and $(2, -2\ln 3)$.
Find the values of a and b.

[3 marks]

d) Solve $1 + \ln e^{x+1} = 5$.

[1 mark]

Continued .....

QUESTION 5 [10 marks]

a) Find the equation of circle that has the points (-1, 6) and (3, -4) as the endpoints of its diameter. [2.5 marks]

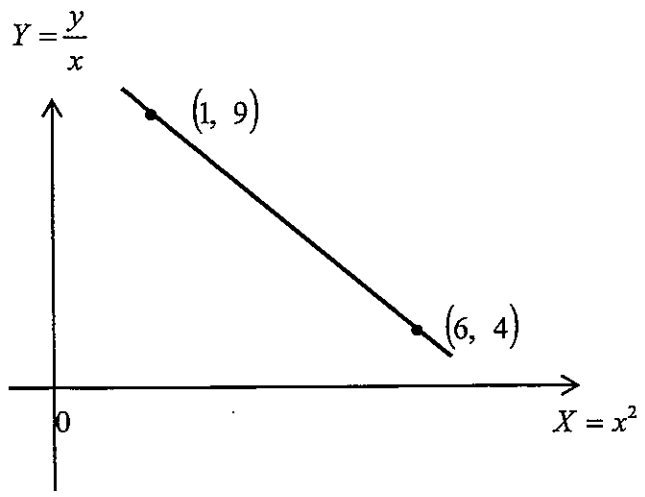
b) Find an equation of the line that passes through the point (4, -3) and is perpendicular to the line $2x - 3y + 5 = 0$. Write the equation in slope-intercept form. [2.5 marks]

c) Consider the graph of the quadratic function $f(x) = (x - 2)^2 - 1$, which is a parabola.
(i) Determine the coordinates of its vertex.
(ii) Determine also its x-intercepts and its y-intercept.
(iii) Hence sketch the graph.
[3 marks]

d) Two variables x and y are related by an equation $y = ax^3 + bx$ where a and b are constants.

The figure below shows a straight line graph by plotting $Y = \frac{y}{x}$ against $X = x^2$.

Points $(1, 9)$ and $(6, 4)$ lie on the line.



Find the values of a and b.

[2 marks]

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